

# PATENT SPECIFICATION

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## COMPLETE SPECIFICATION

### DRAWINGS ATTACHED

#### Apparatus for Cleaning Surfaces

I, GIUSEPPE PACCAGNELLA, an Italian citizen, of Via Pagliano 40, Milano, Italy, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to an improved apparatus for cleaning surfaces, particularly the surfaces of a vehicle and the like.

A number of different methods and apparatuses have become known to the art for cleaning vehicles, specifically motor vehicles and railway rolling stock. These known methods either act upon the surface to be cleaned by means of brushes and washing liquids or the washing liquid is admixed with a jet of water under relatively high pressure which is directed against the surface. It has been found, however, that all of these processes in a relatively short period of time cause damage to the surfaces to be cleaned which are generally coated with varnish or paint or are chrome-plated metal parts. This is due to the fact that in order to loosen the dirt either the brushes or the water act upon the surfaces with relatively high pressure. This causes dulling of the varnish or separation from its base. On the other hand, if insufficient pressure is available it is not possible to clean the surfaces properly.

Accordingly, it is a primary object of the present invention to provide an improved apparatus for cleaning surfaces which overcome the disadvantages noted above appearing in prior art methods and apparatuses.

According to the present invention there is provided an apparatus for cleaning surfaces, particularly the surfaces of a vehicle, comprising at least one blower incorporated

[Price 4s. 6d.]

ing a housing provided with an impeller, said housing including air guide means, at least one liquid spray nozzle cooperating with said air guide means for finely dividing a liquid emanating from said liquid spray nozzle by means of an air current flowing through said air guide means.

Using the apparatus of the invention only a small quantity of liquid is required, and the scouring action of brushes or of a water jet directed upon the surfaces is not needed. The air current or stream leads away the liquid containing the dirt in a manner which in no way harms the treated surfaces. At the same time the air current assists in distributing the liquid upon the surface and in loosening the dirt. Finally, the air current can be used for drying the cleaned wet surface when the feed of washing liquid is shut-off.

The invention will more readily be understood from the following description, given by way of example, with reference to the accompanying drawings in which:—

Figure 1 is a cross-sectional view of a first embodiment of radial-flow blower with spray nozzle means;

Figure 2 is a second embodiment of radial-flow blower possessing a modified arrangement of spray nozzle means from that shown in Figure 1;

Figure 3 is a cross-sectional view of an axial-flow blower with spray nozzle means according to a third embodiment of the invention;

Figure 4 is a cross-sectional view of a further embodiment of axial-flow blower with modified arrangement of the spray nozzle means;

Figure 5 schematically illustrates one embodiment of cleaning apparatus employing a gantry frame and blowers carried thereby;

Figure 6 is a top plan view of the clean-

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ing apparatus of Figure 5; and

Figure 7 is a side view of the cleaning apparatus of Figure 5 showing the arrangement of the blowers and auxiliary devices employed for the cleaning operation.

Describing now the drawings, the radial flow blower A of Figure 1 incorporates a spiral housing 1 provided with an outlet connection 2. The schematically illustrated impeller 3 is seated upon a hollow shaft 4 with which are connected two spray nozzles 5 and 6. The hollow shaft 4 driven by a motor (not shown) of any suitable type is operatively connected via a delivery pump, such as pump 19 of Figures 5 to 7, with a liquid container, such as containers 18 of the same Figures, the latter storing an aqueous solution of a cleansing agent or detergent as conventionally employed for the cleaning of vehicles. Blower A can be arranged either stationarily or for travelling movement. In the event it is stationary it would be possible to provide a pivotable mounting therefor or a blast pipe connection can be attached to it.

During operation of the cleaning apparatus the outlet connection 2 or its extension (not shown) is directed towards the surface to be cleaned. The impeller 3 of this blower A delivers air to the outlet connection 2, the air serving as a conveying medium for a detergent or washing liquid, for instance a shampoo of suitable composition, which leaves the spraying nozzles 5 and 6 and is finely divided in the air current. The air current containing the washing liquid in mist or atomised form after leaving the outlet connection 2 arrives at the surface to be cleaned and is distributed thereupon. Due to the deflection which takes place by impingement of the air current against such surface the atomised liquid particles or mist deposit themselves upon such surfaces. The thus wetted surface is now continuously rinsed or contacted by the air current, whereby the liquid particles or the forming foam is uniformly and very finely distributed. The dirt adhering to the surface is loosened and carried away due to the fine division of the washing liquid and the rinsing action of the air. If the surface which is treated is freed of dirt, then any liquid which eventually still adheres to such surface can be removed through drying by means of the air current after the infuse of washing agent to the spray nozzles 5, 6 is interrupted.

The embodiment depicted in Figure 2 differs from that of Figure 1 only insofar as, in this instance, a spray nozzle 7 is arranged at the outlet connection 2 or at its extension (not shown). The spray nozzle 7 directs the washing agent solution into contact with the air current only after the latter leaves the housing 1 of the blower A.

In the respective embodiments of Figures 3 and 4 there is shown an axial flow blower B which, in each instance, is equipped with an impeller 11. In the arrangement of Figure 3 spray nozzles 12 and 13 mounted on a hollow shaft 16 are arranged upstream or in front of the impeller 11 considered with respect to the flow direction of the air indicated by arrows C. In the embodiment of Figure 4 a spray head 14 is arranged downstream or behind the impeller 11, again considered with respect to the direction of air flow. Spray head 14 is mounted on a hollow shaft 15. In both cases, the washing agent solution is divided into finely atomised particles or mist by spraying into the air current and by means of the latter deposits upon the surfaces to be cleaned which should extend approximately transverse to the flow direction of the air. It will be understood that the operation of the embodiments of Figures 3 and 4, also that of Figure 2, corresponds to the operation described during consideration of Figure 1.

In Figures 5 to 7 there is depicted a substantially complete cleaning apparatus, with only the essential details of the individual components thereof being described. By referring to such Figures it will be seen that a travelling framework or gantry frame 16, for example formed of tubing and travelling upon rubber wheels 23, has mounted thereon five electrically operated blowers 17. It will be appreciated that such blowers can be of the type considered during the discussion of Figures 1 to 4 and, in fact, can embody any suitable blower constructed according to the invention and which enables the washing liquid to be finely divided by the air stream. For convenience, it has been assumed that the blowers 17 shown in Figure 5 are radial flow blowers such as described in Figures 1 and 2. At the air guide means or outlet connection 17a of these blowers 17 there is operably associated therewith spray nozzle means not visible in Figure 5, for the detergent or washing liquid and for water. As indicated, the outlet connections 17a of the blowers 17 are directed towards the surfaces to be cleaned, for instance a vehicle (not shown). The air blown by the blowers 17 and streaming past the spray nozzles sucks the relevant liquid out of such spray nozzles and atomises it. By referring to Figure 7 it will be seen that two washing liquid containers 18 storing a suitable detergent or cleansing agent are mounted on the gantry frame 16. An electric driven pump 19 feeds the washing agent solution which is mixed with water by means of two electro-magnetic valves 20. Two further electro-magnetic valves 21 regulate the throughflow of water. The gantry frame 16 supports a control device

22 which controls automatic operation of the washing procedure. Control devices suitable for this purpose are well known to the art so that no further details need be given. A conventional drive means 24 is operably associated with the wheels 23 for moving the gantry frame back and forth, the drive means 24 incorporating a suitable electric motor and power transmission with means for reversing the direction of rotation

Forward pass, approximately one minute:

25 Cut-out period, approximately one minute:

Reverse pass, approximately one minute:

Cut-out period, approximately one minute:

30 Forward and reverse passes of the frame, approximately two minutes:

Two forward and two reverse passes, approximately four minutes:

35 The working procedure can be interrupted at any given sequence by means of a push-button knob or switch 22a and again switched-in. After completion of an operating cycle the installation automatically switches-off. In the event of breakdown or interruption in the supply of current a schematically illustrated coupling 27 arranged between the driven wheels 23 and the detergent agent supply and water supply enables the work to be completed manually. The apparatus under full load requires 2.5 kilowatts, the water consumption for each operation amounts to about 100 to 120 litres.

#### WHAT I CLAIM IS:—

50 1. Apparatus for cleaning surfaces, particularly the surfaces of a vehicle, comprising at least one blower incorporating a housing provided with an impeller, said housing including air guide means, at least one liquid spray nozzle cooperating with said air guide means for finely dividing a liquid emanating from said liquid spray nozzle by means of an air current flowing through said air guide means.

60 2. Apparatus according to claim 1,

for reverse movement of the frame 16. It will be seen that the described cleaning apparatus does not require any guide rails since it is provided with pneumatic tyres 23 and thus can be used at any given semi-flat location. All that is necessary is a supply of electricity and of water.

The washing operation is completely automatic and takes about ten minutes. The different work phases are as follows:

Spraying the first detergent or washing solution whereby the dirt is loosened from the base surface.

Washing solution is effective throughout the dirt layer.

Spraying a washing solution onto the surface a second time.

Dirt is emulsified by washing solution.

Washing away the washing solution with the loosened dirt and rinsing with water.

Drying the surface by means of the air current.

wherein one or more of said blowers are mounted on a travelling framework.

3. Apparatus according to claim 2, further comprising valve means and pump means carried by said framework for water and washing solution, control means for automatically controlling the washing operation, and drive means for imparting forward and reverse movement to said travelling framework.

4. Apparatus according to claim 3, wherein said control means enables carrying out completely automatic cleaning of the surface to be cleaned by controlling said valve means, said pump means, said blower and said drive means.

5. Apparatus for cleaning surfaces, particularly the surfaces of a vehicle, such apparatus being constructed and arranged substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

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3 SHEETS

COMPLETE SPECIFICATION

This drawing is a reproduction of  
the Original on a reduced scale.

SHEET 1

FIG. 1

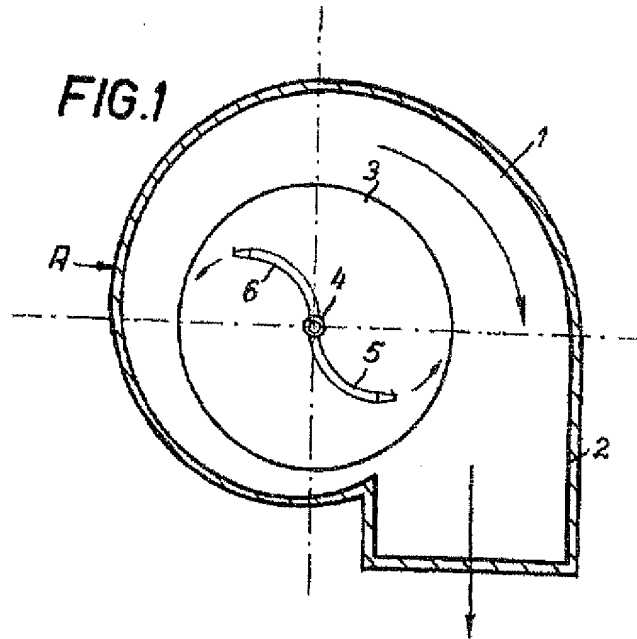


FIG. 2

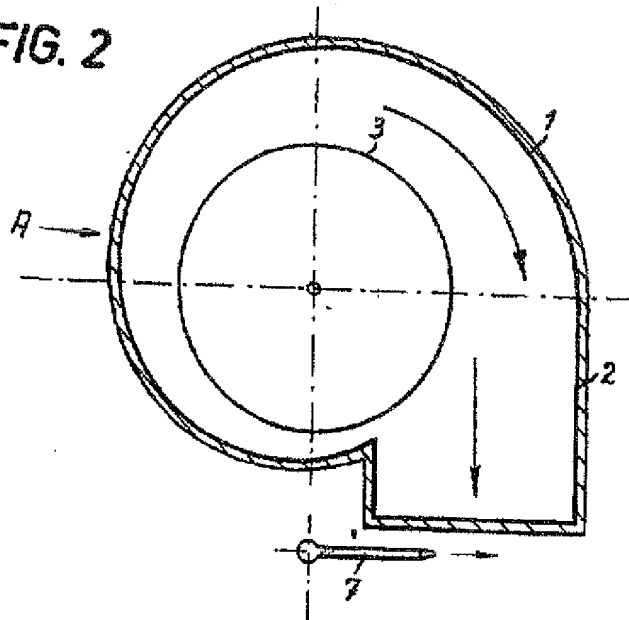


FIG. 3

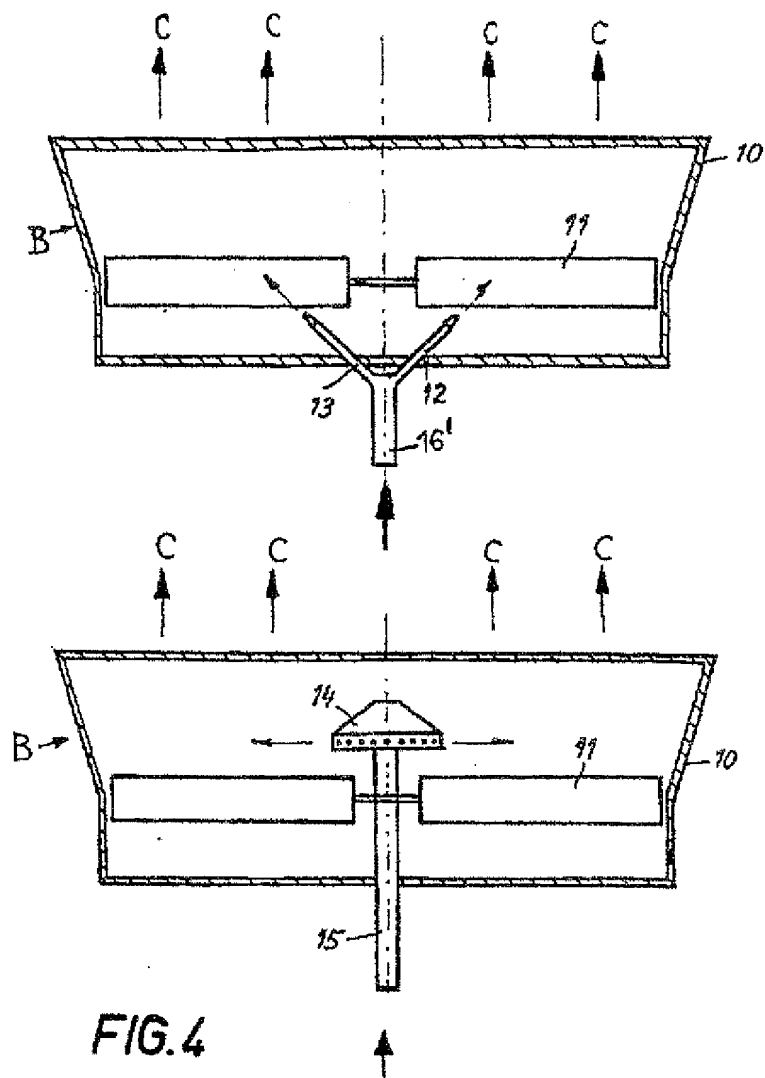


FIG. 4

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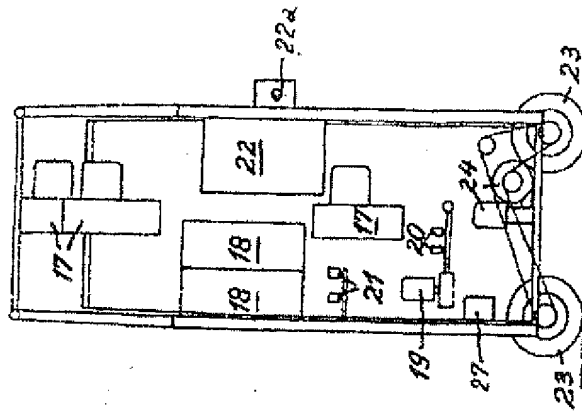


FIG. 7

FIG. 6

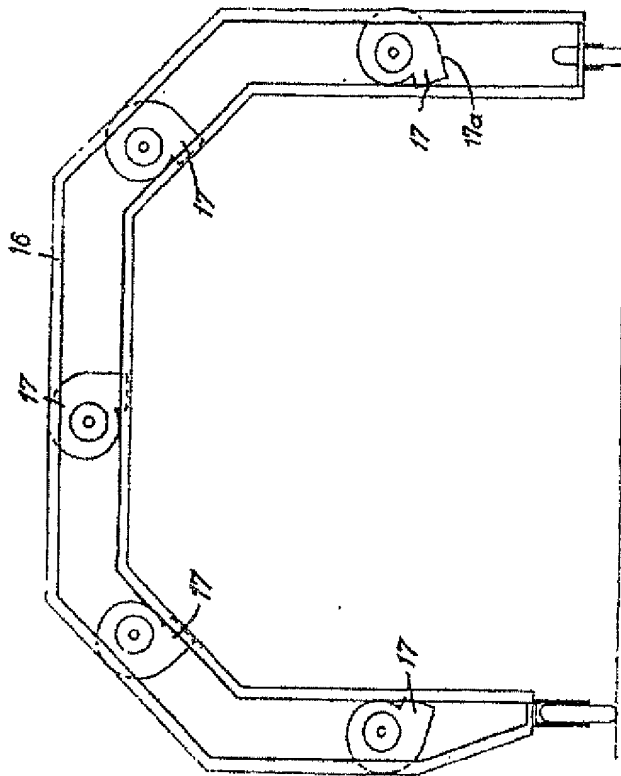
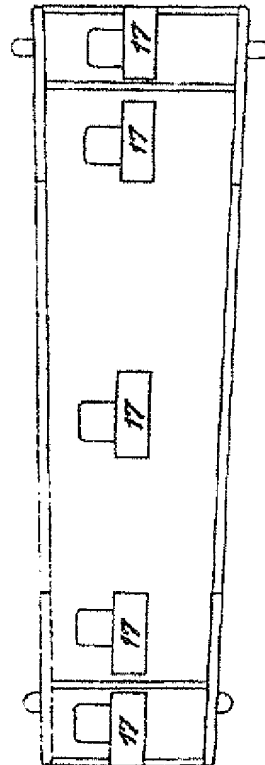
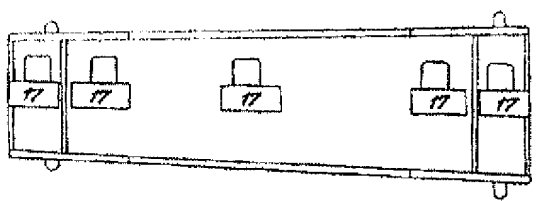
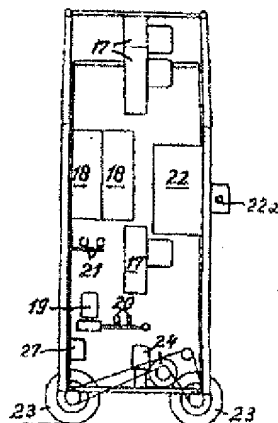
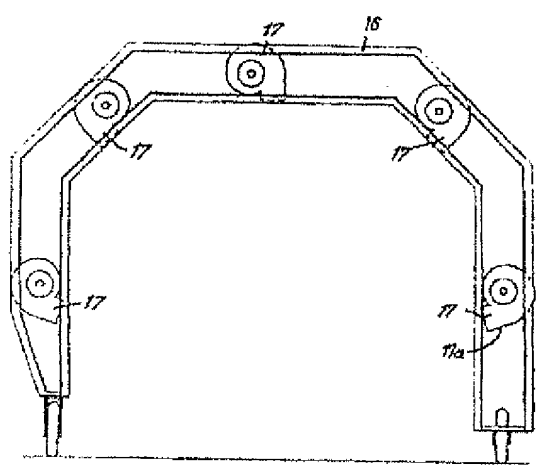
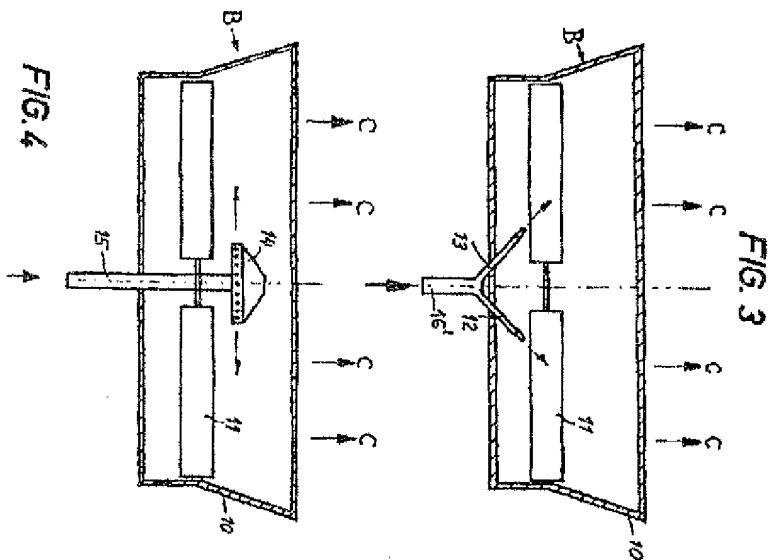


FIG. 5





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3 SHEETS  
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This drawing is a reproduction of  
the original on a reduced scale.  
SHEETS 2 & 3